

REPORT DOCUMENTATION PAGE

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AFRL/PRS

5 Pollux Drive

Edwards AFB CA 93524-7048

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(661) 275-5015

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MEMORANDUM FOR PRS (In-House Publication)

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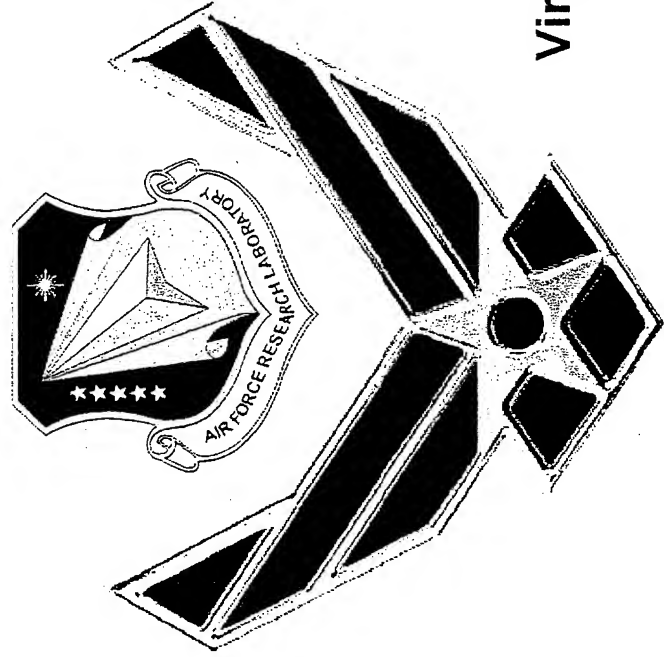
29 Oct 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-211**
- C.T. Liu (PRSM), C.W. Smith (Virginia Poly Inst.), "Near Tip Behavior in a Particulate Composite Material Under Constant Strain Rates Including Temperature and Thickness Effects"

10th International Conf. on Fracture
(Hawaii, 3-7 Dec 2001) (Deadline: 23 Nov 01)

(Statement A)

NEAR TIP BEHAVIOR IN A PARTICULATE COMPOSITE MATERIAL UNDER CONSTANT STRAIN RATES INCLUDING TEMPERATURE AND THICKNESS EFFECTS



C.T. Liu

Air Force Research Laboratory

AFRL/PRSM

10E. Saturn Blvd.

Edwards AFB CA 93524-7680

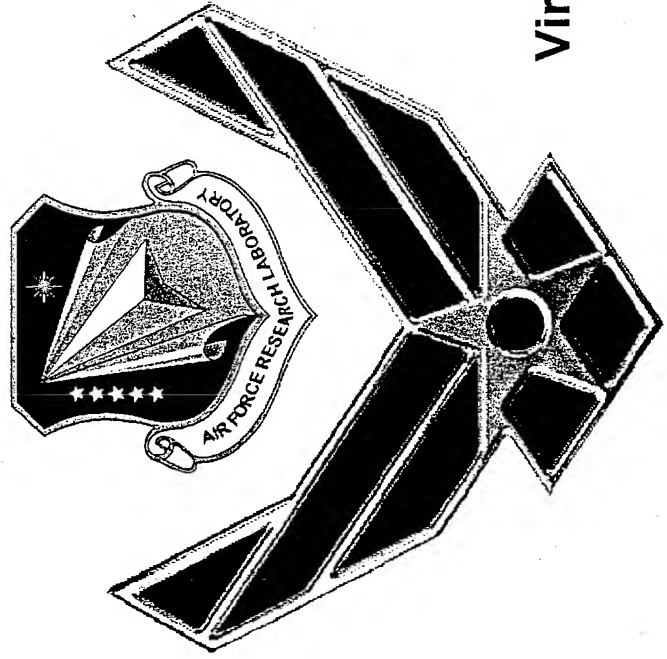
C.W. Smith

ESM Department

Virginia Polytechnic Institute and State University

Blacksburg VA 24061

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AFRL/PRSM

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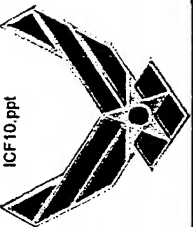
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Smith

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Virginia Polytechnic Institute and State University

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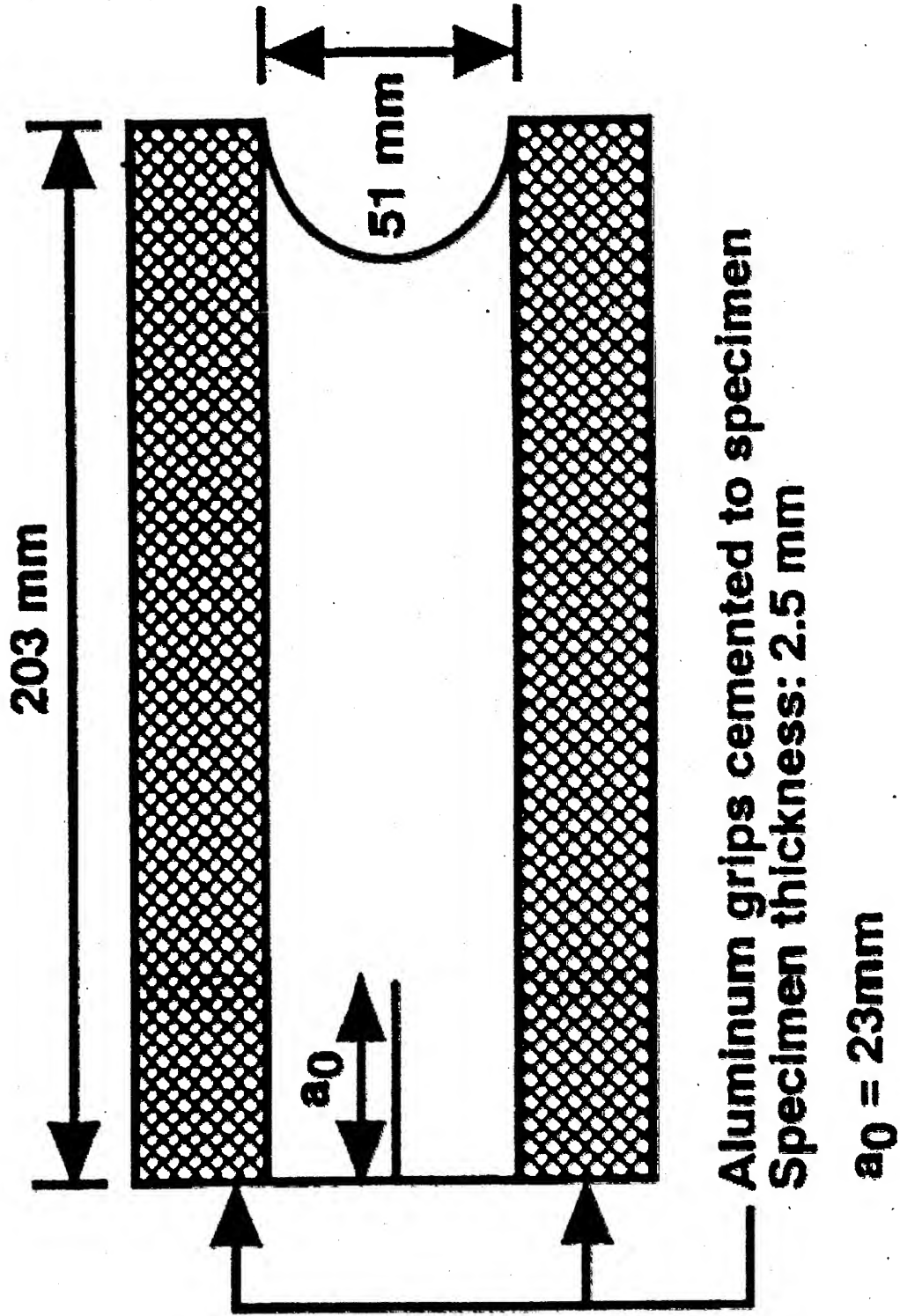


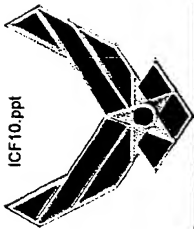
Objectives



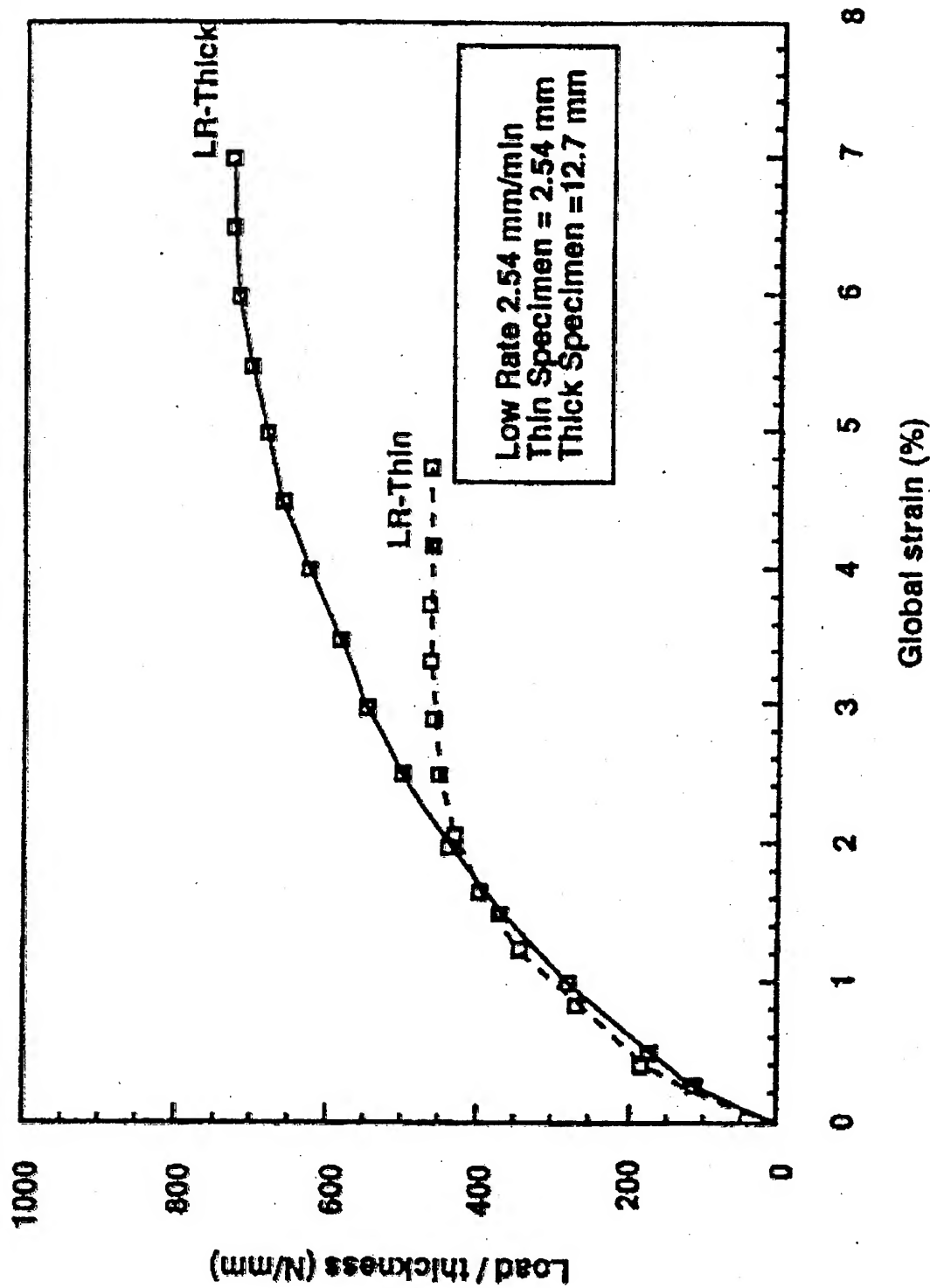
- Investigate the Effects of Temperature and Specimen Thickness on Local Strain Fields and Crack Growth Behavior in a Particulate Composite Material.
- Temperatures: -53.9°C , 22.2°C , and 73.9°C
- Specimen Thickness': 2.54 mm and 12.7 mm

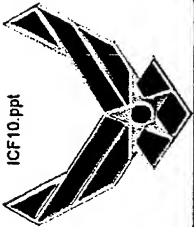
Specimen Geometry



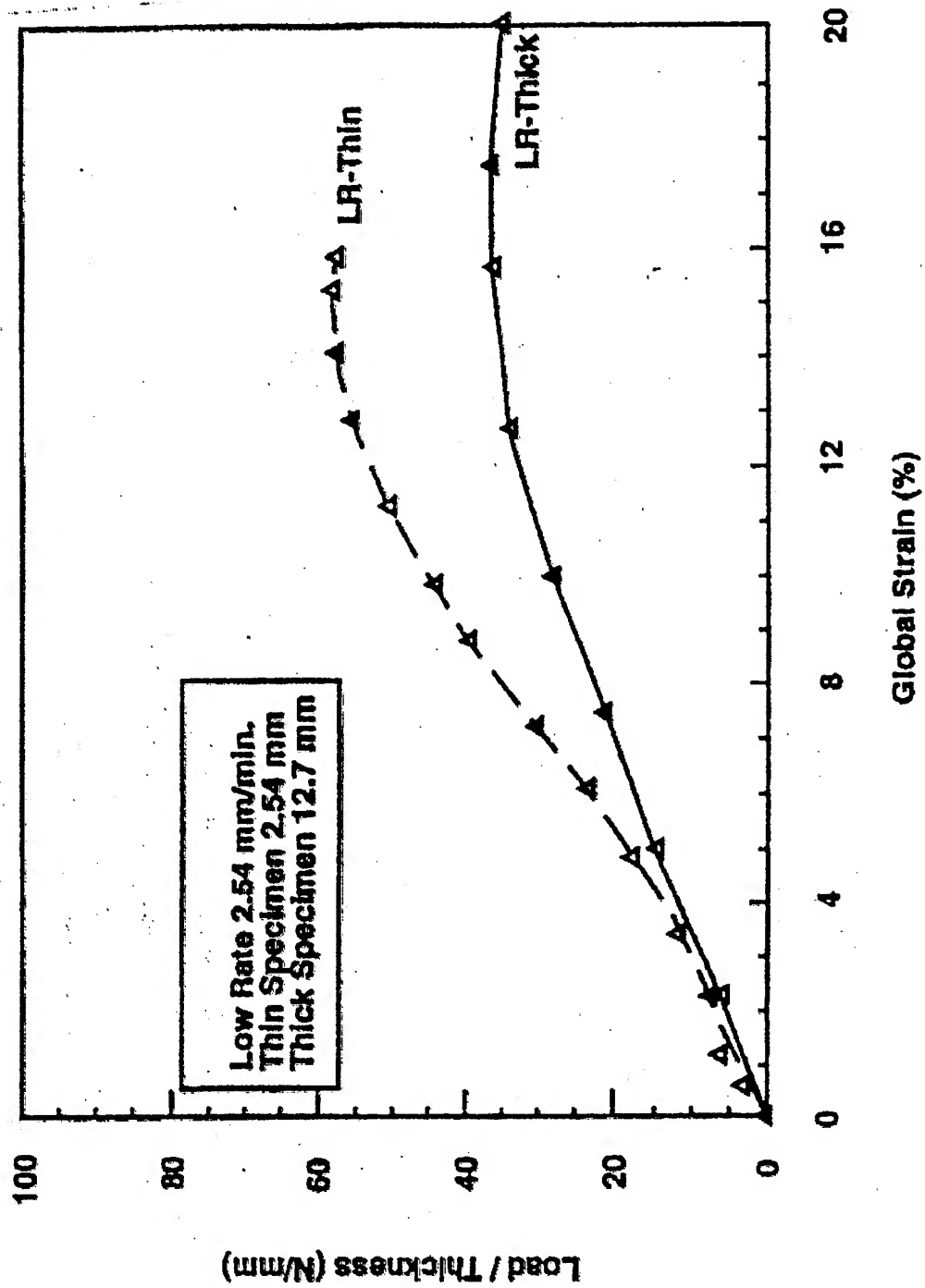


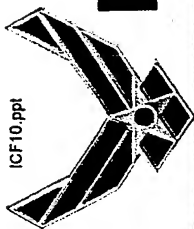
Load-Strain Relations ($T = -53.9^{\circ}\text{C}$)





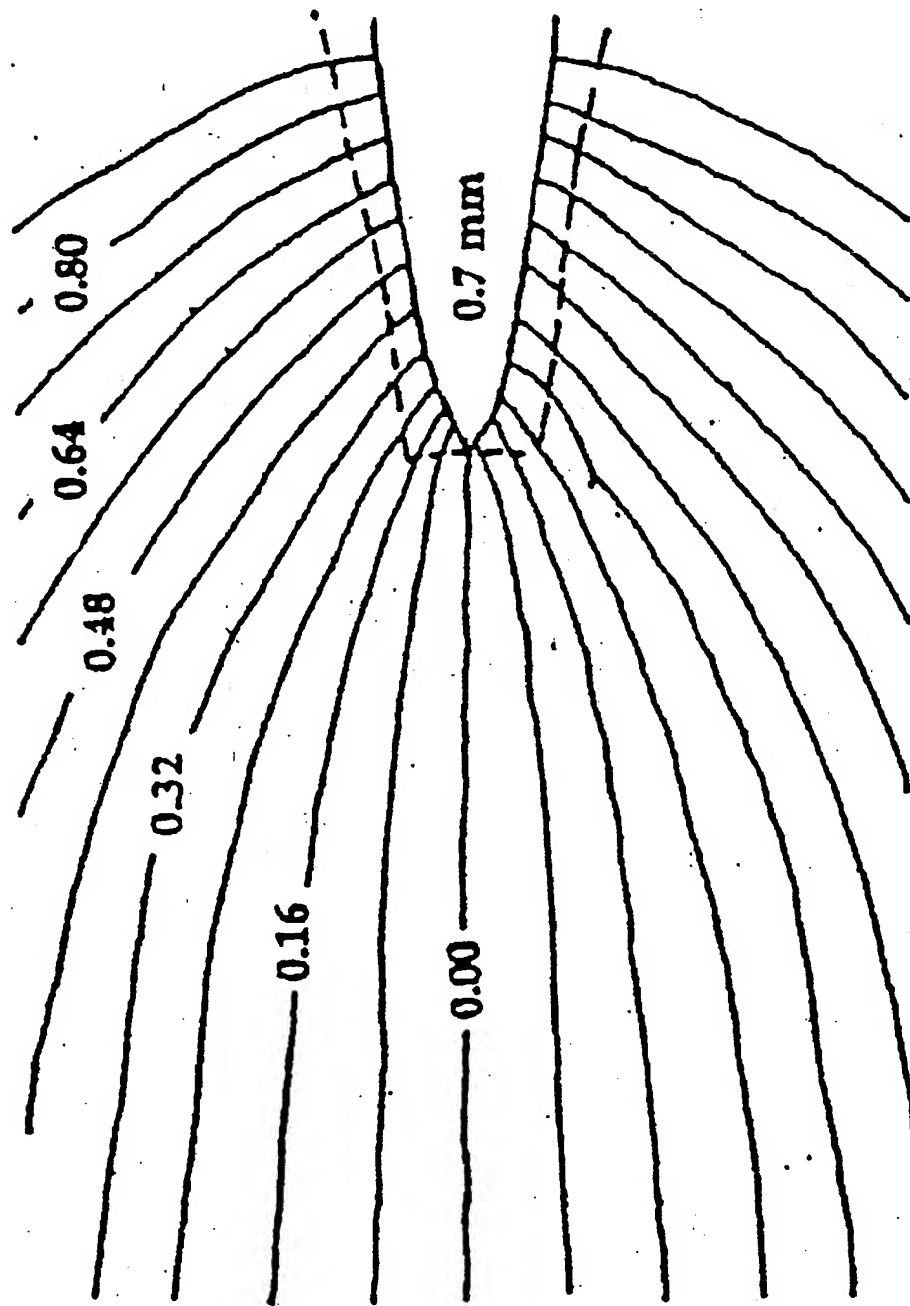
Load-Strain Relations ($T=73.9^{\circ}\text{C}$)

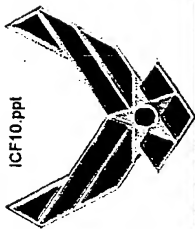




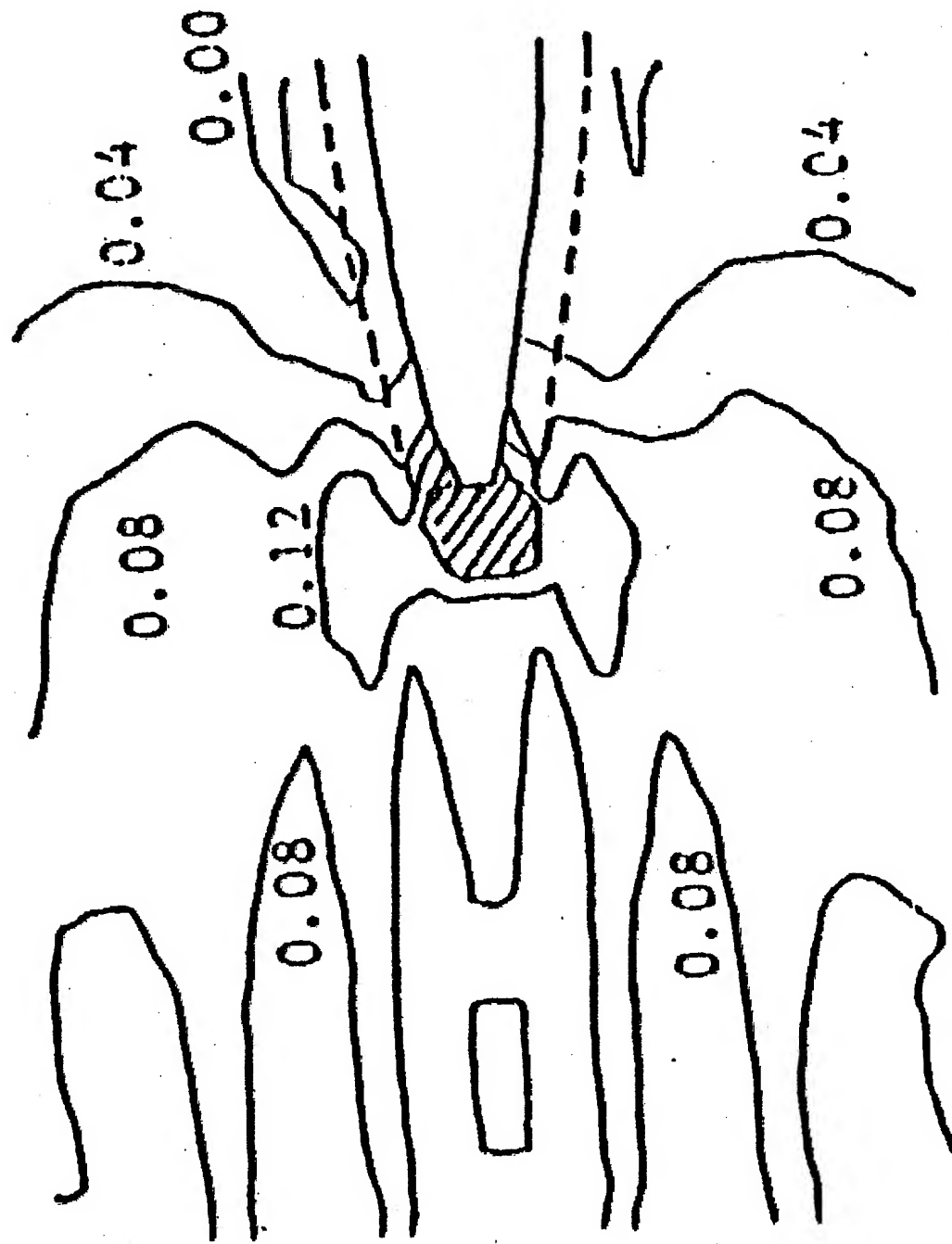
ICF10.ppt

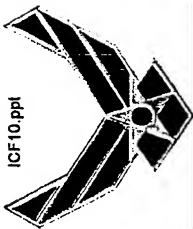
Typical Contour Plots of Normal Displacement ($T = -53.9^{\circ}\text{C}$, $t = 2.54\text{mm}$)



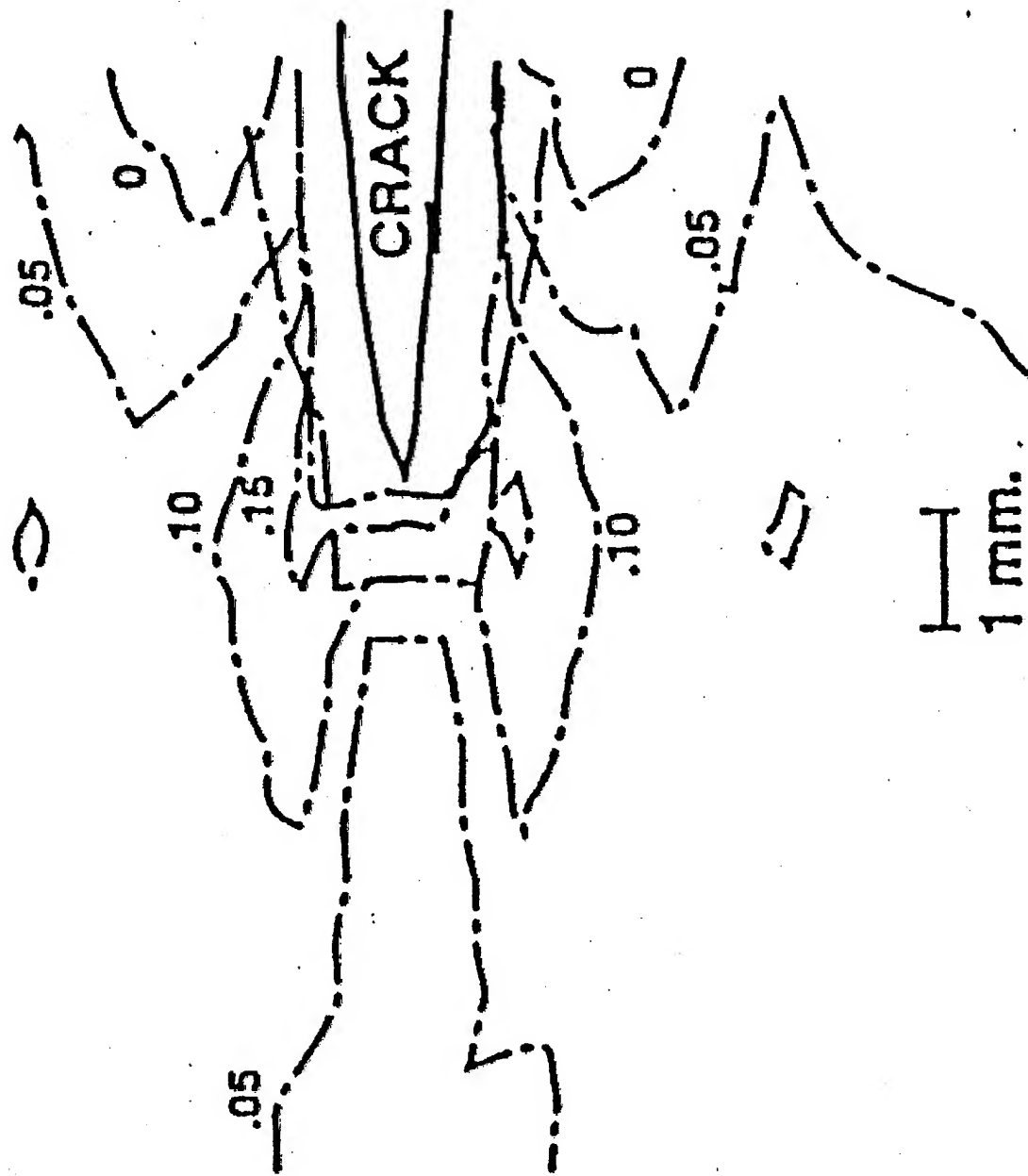


Thickness = 2.54mm



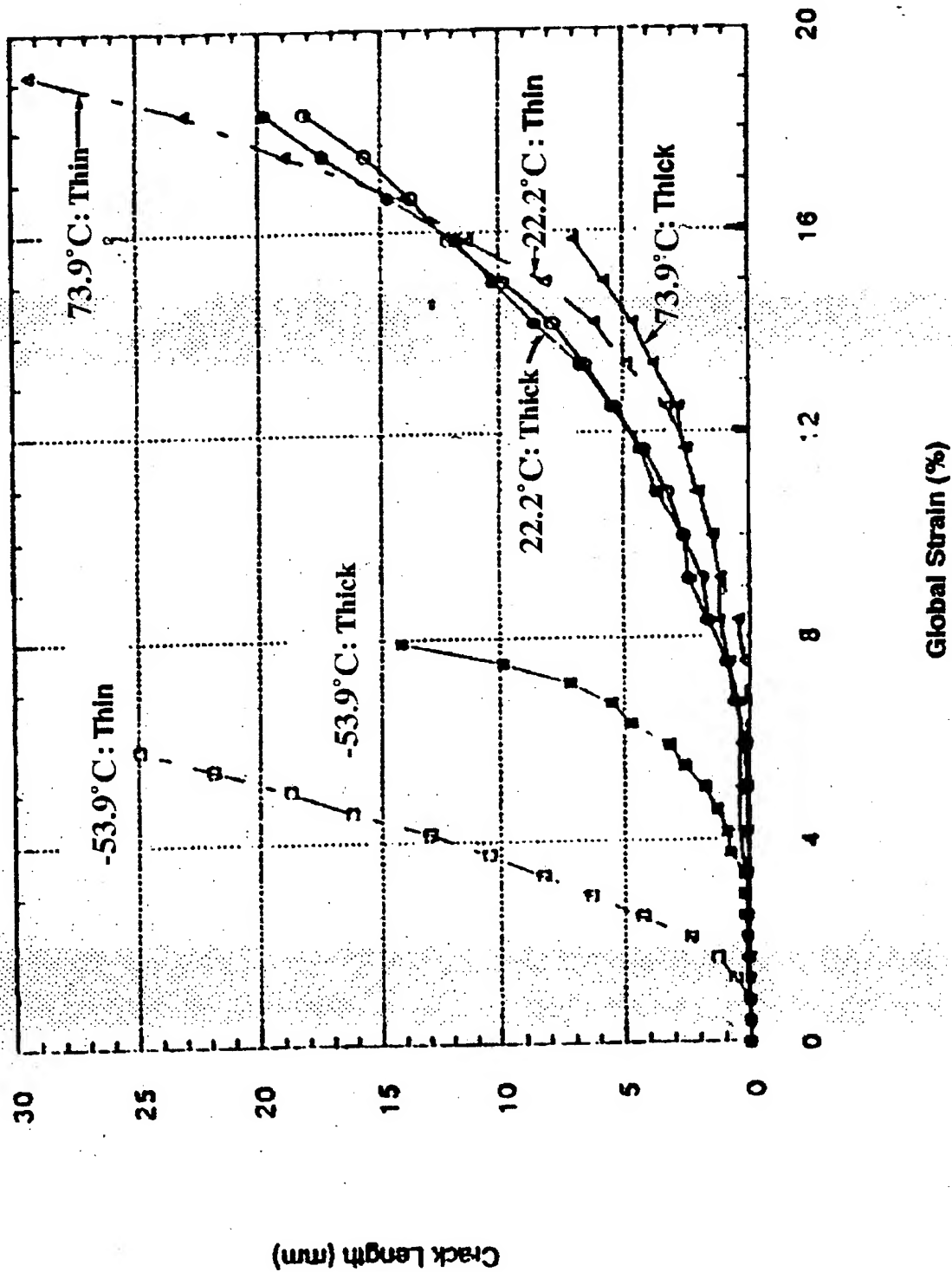


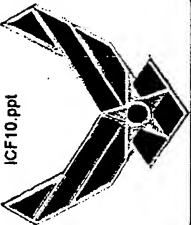
Thickness = 12.7mm



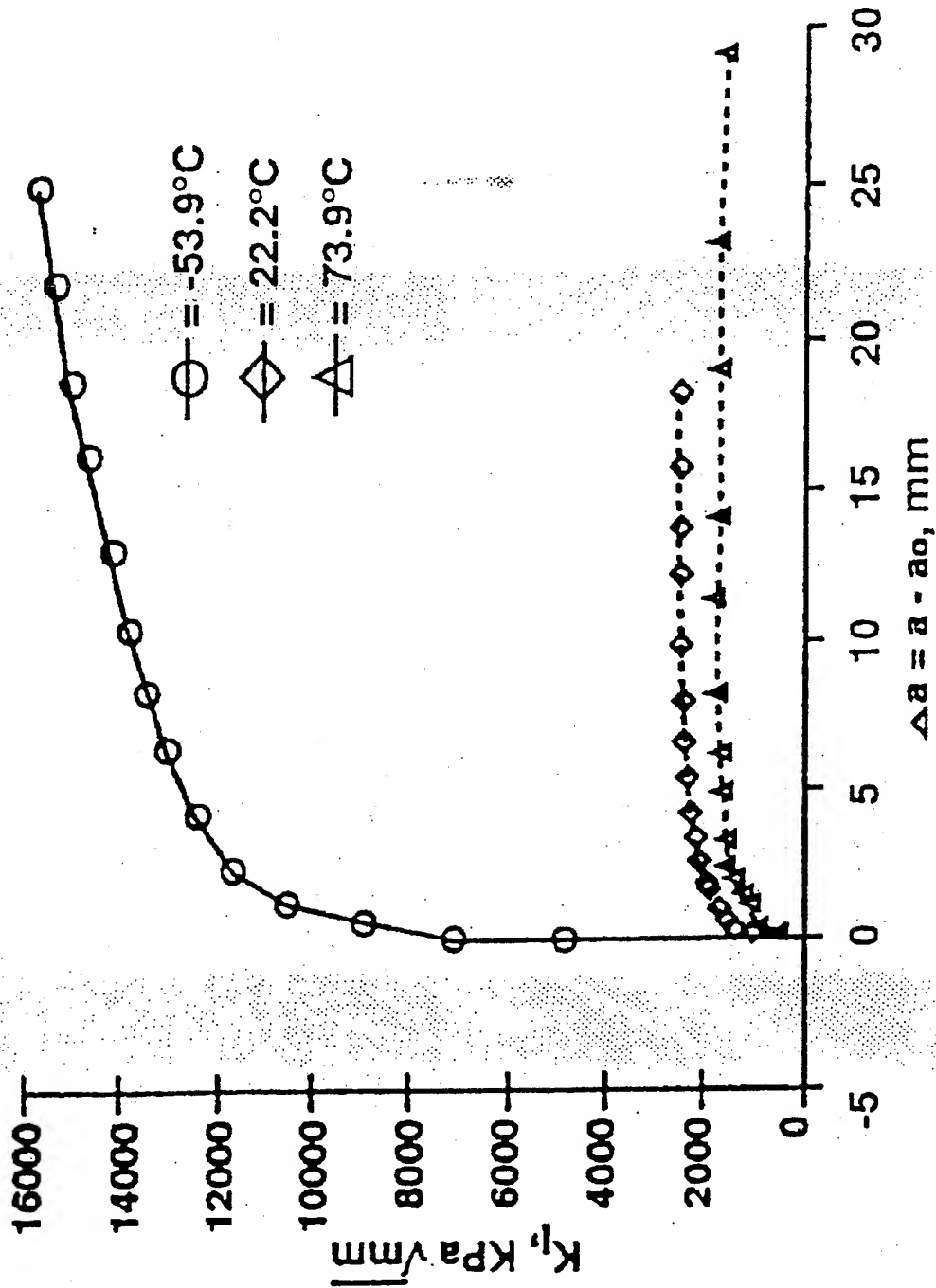


Crack Length (mm) Versus Global Strain (%)



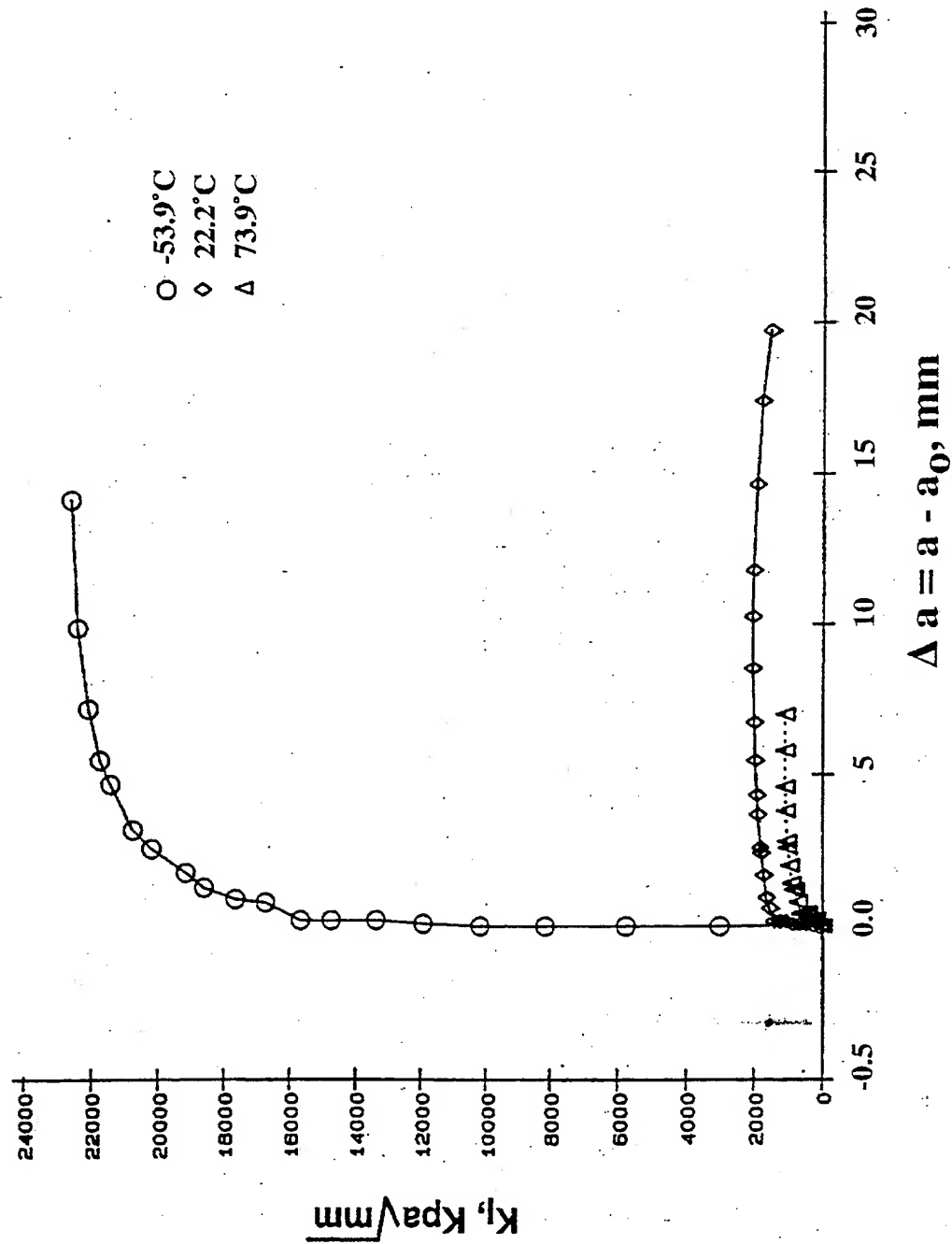


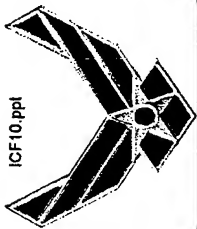
Crack Growth Resistance Curves ($t=2.54\text{mm}$)



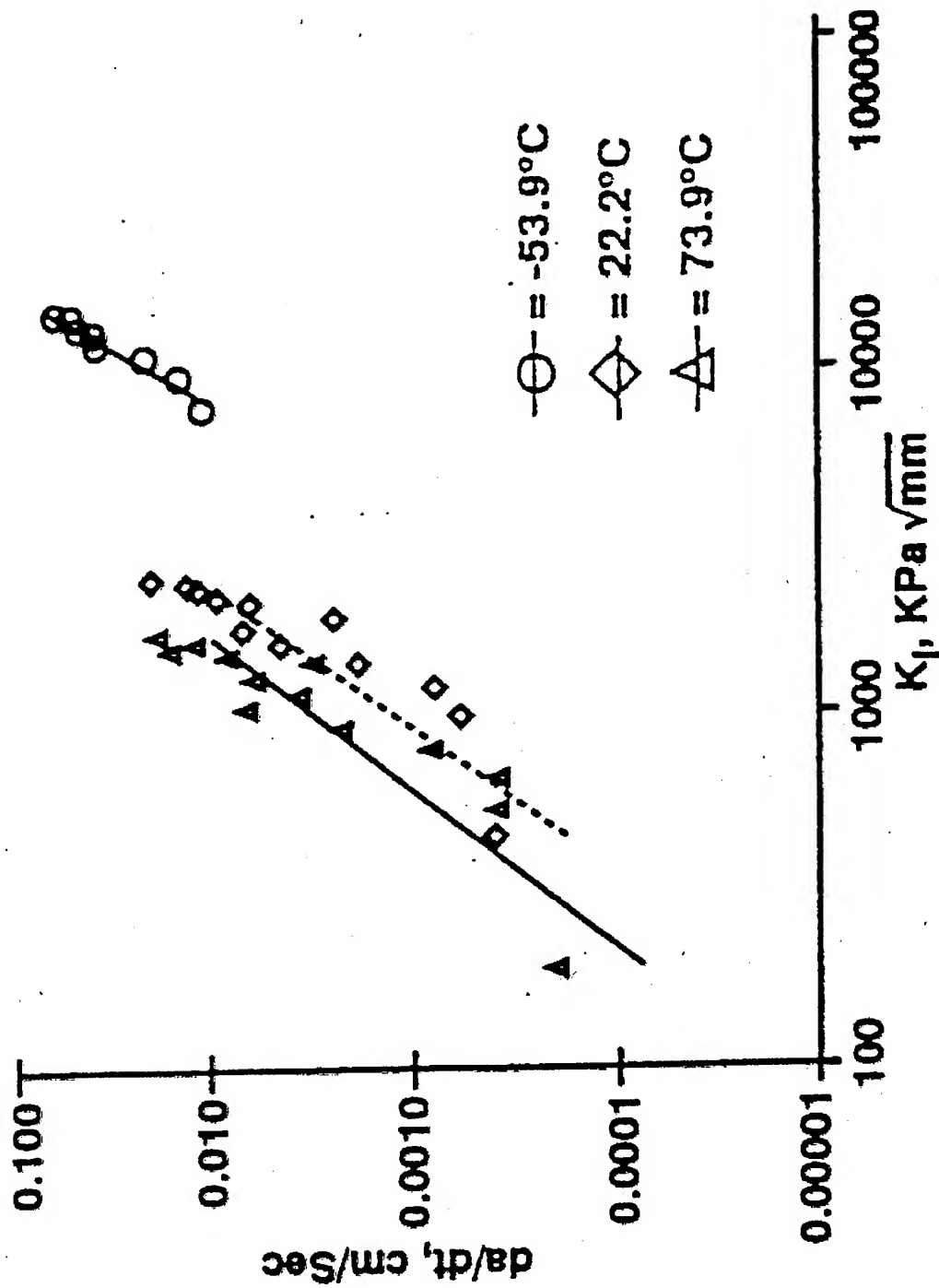


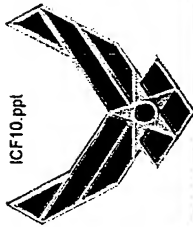
Crack Growth Resistance Curves ($t=12.7\text{mm}$)





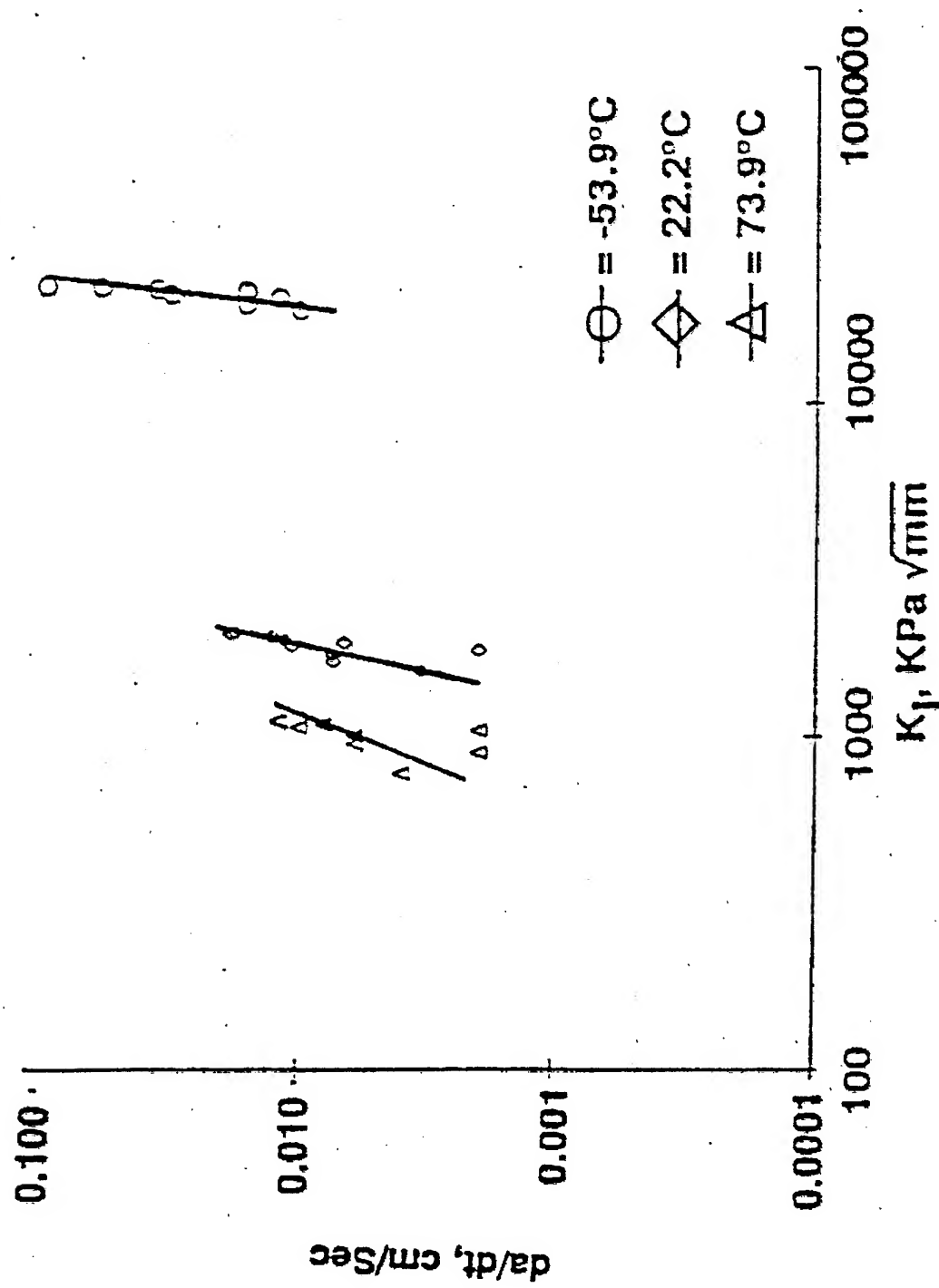
Crack Growth Rate Versus Mode I Stress Intensity factor ($t=2.54\text{mm}$)

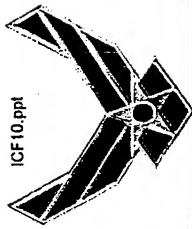




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Crack Growth Rate Versus Mode I Stress Intensity factor ($t=12.7\text{mm}$)





Conclusions

This is an "observation". Can you draw some conclusion from it?

- The crack growth behavior at -53.9°C is significantly different from that at 22.2°C and 73.9°C .
- The increase in specimen thickness alters the local strain fields but the iso-strain contours are of the same general form.
- A power law relationship exists between the Mode I stress intensity factor and the crack growth rate.